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10/538,641	11/09/2005	Elena Bencini	272909US0XPCT	3733
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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P.			SINGH, PREM C	
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ALEXANDRIA, VA 22314			PAPER NUMBER	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/538,641	<b>Applicant(s)</b> BENCINI ET AL.	
	<b>Examiner</b> PREM C. SINGH	<b>Art Unit</b> 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 05 August 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-6,8,9,11,12,14-29,32-37 and 39-51 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6,8,9,11,12,14-29,32-37 and 39-51 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 07/20/2009 has been entered.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-6, 8, 9, 14-19, 21-28, 32-37 and 40-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Girotti et al (EP 0 847 802 A1) ("Girotti") in view of Grootjans et al (US Patent 5,750,814) ("Grootjans").

4. With respect to claims 1 and 42, Girotti discloses a catalyst composition comprising a crystalline zeolite and an inorganic ligand selected from silica, alumina or natural clays or combinations of these (See page 4, lines 1-22). Girotti further discloses that extra zeolite porosity obtained by adding the mesoporosity and macroporosity fractions present in the catalyst composition itself, which is such that a fraction of at least 25% is composed of pores with a radius higher than 100 Å, and is characterized by a total volume of extra zeolitic pores greater than or equal to 0.80 ml/g (See page 4, lines 8-10). Girotti also discloses using alumina in the bohemite form (See page 8, lines 30-31, 46-47).

Although Girotti uses beta zeolite due to "best results in terms of activity in the alkylation of aromatics" (See page 3, lines 18-19), however, Girotti also discloses that

zeolite Y has been widely used as alkylation/transalkylation catalyst by different inventors (See page 2, lines 18-24; page 3, lines 2-4, 19-20).

Grootjans discloses an alkylation process similar to Girotti using similar feedstocks, catalyst and operating conditions (See abstract; Examples 1 and 2). Grootjans also discloses use of zeolite Y and zeolite beta on a refractory oxide binder including gamma alumina (See column 4, lines 50-54; column 5, lines 37-39; column 6, lines 49-52). This clearly indicates that zeolite Y and zeolite beta are functionally similar for the process. This also indicates that any form of alumina, including gamma alumina, is equally effective as a binder.

Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify Girotti invention and use zeolite Y on gamma alumina binder as disclosed by Grootjans because zeolite Y and zeolite beta has been shown to be functionally similar for alkylation/transalkylation process. See *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982).

5. With respect to claims 2 and 41, Girotti discloses crushing strength along the diameter as 7 to 19 Kg/cm (See page 12, Table 1, last line).

6. With respect to claims 3-6, Girotti invention does not specifically disclose apparent density and the particle diameter of the catalyst composition. However the invention does disclose use of the catalyst composition in the form of tablets, bars, cylinders and pellets (See page 5, lines 39-41). Apparent density can easily be

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determined by calculating the mass of the catalyst and the volume occupied by the catalyst. Thus, one skilled in the art will use an apparent density in a range, including as claimed, for proper catalytic process. It would have been obvious to one skilled in the art at the time the invention was made to specify the particle diameter to determine the amount of the catalyst required for the catalytic process.

7. With respect to claim 8, Girotti discloses that zeolite is in acidic form (See page 4, lines 39-40).

8. With respect to claim 9, Girotti discloses ligand (binder) content (w/w%) to be 50, i.e., zeolite to binder (ligand) ratio is 1:1 (See page 12, Table 1).

9. With respect to claims 14 and 15, Girotti invention discloses a process for preparing the catalyst of claim 1 as follows:

(a) Preparing a homogeneous mixture comprising beta zeolite in acidic form and an inorganic ligand (bohemite) (See page 5, lines 8-11; page 8, lines 31-32);

(b) Adding a mixture of acid and demineralized water;

(c) Extrusion;

(d) Drying;

(e) Calcination

(See page 15, Figure 1; Example 4, page 8).

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Girotti is using zeolite beta, but it would have been obvious to use zeolite Y, as discussed under claim 1.

Girotti does not specifically disclose the details of mechanical mixing in step (a), but does disclose mixing by stirring until complete dissolution (See page 7, lines 35-37). Thus, it would have been obvious to one skilled in the art to use a mixer running at a speed in a range, including as claimed, for an effective mixing of components.

Girotti does not specifically disclose the acid strength, but discloses the ratio of acid (peptizing agent) to ligand (binder) to be from 0.028 to 0.121 (w/w). Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify Girotti invention and specify the ratio of acid to the total weight of mixture in step (a).

Girotti discloses aging and drying at a temperature ranging from room temperature to 200°C (See page 13, lines 37-38).

Girotti discloses calcination at a temperature ranging from 400-600°C (See page 13, lines 35-36).

Although Girotti does not specifically disclose drying time and calcinations time, it would have been obvious to one skilled in the art at the time the invention was made to use an optimum time in a range, including as claimed, for proper drying and calcination, respectively.

10. With respect to claims 16 and 17, Girotti invention discloses using acetic acid (See page 12, Table 1).

11. With respect to claim 18, Girotti invention discloses a process for transalkylation of aromatic hydrocarbons comprising putting an aromatic hydrocarbon in contact with a polyalkylated aromatic hydrocarbon in the presence of the catalyst of claim 1, operating so that the reaction takes place at least partially in liquid phase (See claim 22, page 14, lines 14-17).

12. With respect to claim 19, Girotti discloses that the zeolite is selected from zeolite Y, beta, and ZSM-12 (See page 3, lines 18-20) and the zeolite is in acidic form (See page 4, lines 39-40).

13. With respect to claim 21, Girotti invention discloses temperature ranging from 150 to 300°C, pressure ranging from 20 to 45 atm, and a WHSV ranging from 0.1 to 10 h<sup>-1</sup> (See claim 24, page 14, lines 22-23).

14. With respect to claims 22 and 23, Girotti invention discloses molar ratio between aromatic hydrocarbon and polyalkylaromatic hydrocarbon is between 1 and 30 (See claim 25, page 14, lines 25-26).

15. With respect to claim 24, Girotti invention discloses that the aromatic hydrocarbon is benzene (See claim 26, page 14, line 28).



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16. With respect to claim 25, Girotti invention discloses that polyalkylated aromatic hydrocarbon is selected from diethyl benzene and diisopropyl benzene (See claim 27, page 14, lines 30-31).

17. With respect to claim 26, Girotti invention discloses that the aromatic hydrocarbon is preferably benzene. The polyalkylated aromatic hydrocarbon is preferably selected from diethyl benzene and possibly triethyl benzene (See page 6, lines 45-48).

18. With respect to claims 27 and 43-51, Giroti discloses a process for preparing mono-alkylated aromatic hydrocarbons comprising: (See page 7, lines 25-31).

1) contacting an aromatic hydrocarbon and a C<sub>2</sub>-C<sub>4</sub> olefin, including ethylene and propylene (See page 14, line 1), with each other, in the presence of an acidic catalyst (zeolite beta), under such alkylation conditions that the reaction takes place at least partially in liquid phase; (See page 7, lines 25-31).

2) separating the product obtained into a fraction containing an aromatic hydrocarbon, a fraction containing a monoalkylated aromatic hydrocarbon and a fraction containing polyalkylated aromatic hydrocarbons; (See page 7, lines 25-31).

3) contacting the fraction containing the polyalkylated aromatic hydrocarbons with an aromatic hydrocarbon, in the presence of the catalyst of the present invention, under such transalkylation conditions that the reaction takes place at least partially in liquid phase. (See page 7, lines 25-31).

As discussed under claim 1, it would have been obvious to one skilled in the art at the time the invention was made to modify Girotti invention and use zeolite Y on gamma alumina binder as disclosed by Grootjans because zeolite Y and zeolite beta have been shown to be functionally similar for alkylation/transalkylation process. See *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982).

19. With respect to claim 28, Girotti discloses that the zeolite is selected from zeolite Y, beta, and ZSM-12 (See page 3, lines 18-20) and that zeolite is in acidic form (See page 4, lines 39-40).

20. With respect to claims 32-34, Girotti invention discloses that olefin in step (a) is ethylene and propylene and aromatic hydrocarbon is benzene (See page 14, lines 1-3; page 13, line 57).

21. With respect to claim 35, Girotti invention discloses that step (a) uses zeolite beta (See page 3, lines 18-20), olefin is ethylene (See page 14, line 3), and aromatic hydrocarbon is benzene (See page 13, line 57).

22. With respect to claim 36, Girotti invention discloses that the polyalkylated aromatic hydrocarbon is preferably selected from diethylbenzene (See page 6, lines 46-47).

23. Claim 37 has all the limitations of claim 27 and discussed before. Additionally, the claim requires in step (a), benzene as hydrocarbon and ethylene as olefin; in step (b) the claim requires fractions containing benzene, ethyl benzene, diethyl benzene, and heavy hydrocarbons with boiling point higher than 260°C; and in step (c) the third fraction putting in contact with benzene.

Girotti discloses steps (a) through (c) on page 6 (lines 45-50). Example 9 (See page 9, lines 44-58; page 10, lines 1-3) shows details of step (a) and (b) and Example 13 (See page 10, lines 54-56; page 11, lines 1-19) shows details of Step (c).

Although Girotti invention does not specifically disclose heavy hydrocarbons with boiling point higher than 260°C, the invention does disclose the analysis of alkylated liquid product by gas chromatography (See page 9, line 54). Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify Girotti invention, and specify the boiling point of heavy hydrocarbons for their proper characterization.

24. With respect to claim 40, Girotti invention discloses using gas chromatography to analyze alkylated products comprising diethyl-, triethyl-, diisopropyl-, and triisopropyl benzene (See page 6, lines 45-50). The invention also discloses 19.8 wt% heavy products (See page 11, lines 1-14). Girotti's silence on butyl benzene in the product may read zero or negligible amount.

Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify Girotti invention, and specify the butyl benzene content

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which might be negligible. It is to be noted that zero butyl benzene in Girotti invention reads on the Applicant's claim of not higher than 2%.

25. Claims 11, 12, 20 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Girotti et al (EP 0 847 802 A1) ("Girotti") in view of Grootjans et al (US Patent 5,750,814) ("Grootjans") and further in view of Ward et al (US Patent 4,185,040) ("Ward").

26. With respect to claims 11, 12, 20 and 29, Girotti invention does not specifically disclose  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio for zeolite Y.

Ward discloses a process similar to Girotti for alkylation of aromatic hydrocarbons using a zeolite Y catalyst on a mineral oxide binder, including alumina (See abstract; column 3, lines 21-48). Ward also discloses  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio for zeolite Y between about 2 and 80 (See column 3, lines 21-24).

Thus, it would have been obvious to one skilled in the art at the time of invention to modify Girotti invention and specify the  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio for zeolite Y as disclosed by Ward for proper characterization of the catalyst.

27. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Girotti et al (EP 0 847 802 A1) ("Girotti") in view of Grootjans et al (US Patent 5,750,814) ("Grootjans") and further in view of Applegath et al (US Patent 3,848,012) ("Applegath").

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28. With respect to claim 39, Girotti does not disclose using flux oil in step (c).

Applegath discloses a process similar to Girotti for alkylation of aromatics (See abstract). Applegath also discloses that the heavy products obtained at the bottom of the distillation column along with polyalkylated products, comprise flux oil (See column 5, lines 66-68; Table 1).

Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify Girotti invention, and specify the flux oil content in the bottoms as disclosed by Applegath to characterize the product quality obtained in the alkylation process.

### ***Response to Arguments***

29. Applicant's Declaration under 37 CFR §1.132 filed 08/05/2009 and arguments with respect to claims 1-6, 8, 9, 11, 12, 14-29, 32-37 and 39-51 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prem C. Singh whose telephone number is 571-272-6381. The examiner can normally be reached on 7:00 AM to 3:30 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/PREM C SINGH/  
Examiner, Art Unit 1797